

# PATENT SPECIFICATION

DRAWINGS ATTACHED

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## COMPLETE SPECIFICATION

### Injection Syringe and Combination thereof with a Cartridge

We, AMERICAN HOME PRODUCTS CORPORATION, a corporation organized under the laws of the State of Delaware, United States of America, of 22 East 40th Street, New York 16, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a one-piece injection syringe body provided with a slidable push rod and adapted to contain various types of cartridges in usable position securely held against lengthwise displacement, and to a cartridge-syringe assembly including the one-piece syringe body.

In the development of injection syringes of the type employing a disposable sealed cartridge, it was early recognized that means must be provided to secure the cartridge against lengthwise displacement to permit both aspiration and injection. It has previously been proposed to provide such means in the form of a screw thread on the needle hub of a cartridge-needle unit mating with a complementary thread in the syringe body.

It is one object of the present invention to provide cartridge-securing means that does not require a screw thread.

It is a further object of this invention to provide a one-piece syringe body that may be used either with cartridges provided with a threaded hub or cartridges not provided with such a hub.

It is an additional object of this invention to provide a simplified integral syringe body for the above described purpose which has no separate parts other than the functionally essential push rod.

In accordance with the present invention, there is provided a one-piece injection syringe body provided with a slidable push rod and adapted to be used with a cartridge having a slidable plunger at one end and a shoulder

at the other end, said syringe body comprising a tubular barrel, a proximal closure and a distal closure, the slidable push rod mounted in an axial opening in the proximal closure and having means for attachment to the cartridge plunger, an opening in the distal closure less in diameter than the internal diameter of the barrel but sufficient to permit the passage of an injection needle, the barrel having an internal diameter to accommodate the cartridge and being provided with a central longitudinal opening as wide as the internal diameter of the barrel and sufficiently long to permit the insertion and seating of the cartridge within the barrel, the ends of said opening being spaced respectively from the proximal and distal closures, and a protuberance formed on the inner surface of the barrel near its distal end adapted to engage the cartridge shoulder and to cooperate with the distal closure wall in preventing lengthwise displacement of the cartridge during aspiration and injection.

The invention also includes the just-described one-piece injection syringe body in combination with a cartridge-needle unit mounted in the syringe, the cartridge-needle unit comprising a cartridge having a slidable plunger at one end connected to the slidable push rod of the syringe, a needle hub secured to the other end of the cartridge, a needle fixedly mounted in the needle hub, and a protective sleeve surrounding the needle, the protected needle projecting through the opening in the distal closure and the needle hub being firmly seated between the protuberance on the inner surface of the barrel and the inner wall of the distal closure.

The proximal closure of the barrel has a central hole slidably accommodating a push rod, and the distal closure has a central hole large enough to permit the passage of an injection needle (which may be covered by a rubber sleeve) but small enough so that the closure wall forms an abutment for the distal end of the cartridge. The proximal closure of the

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barrel may advantageously be provided with a pair of finger pieces cooperating with a finger piece or button on the proximal end of the push rod, and a small finger hole to facilitate the removal of a cartridge may be provided in the side of the barrel opposite the larger opening through which the cartridge is inserted.

The inner surface of the barrel is provided near its distal end with a protuberance adapted to engage a shoulder at the distal end of the cartridge and to cooperate with the distal closure wall in preventing lengthwise displacement of the cartridge during aspiration and injection. This protuberance is advantageously in the form of a raised arcuate internal fillet having an angular extent of less than 180°, or it may be an inwardly directed flange at the distal end edge of the central opening, but other forms are possible.

Our syringe body is adapted to be used with any type of injection cartridge having a slidable plunger at one end and a shoulder at the other capable of being engaged by the protuberance. It is particularly adapted to be used with cartridge-needle units as described below.

Our invention includes the novel syringe body and the combination of the syringe body with an injection cartridge.

The following description and accompanying drawing of preferred embodiments of our invention are intended to be illustrative only and not to limit our invention, the scope of which is defined in the appended claims.

In the drawing:

Fig. 1 is a side view of our syringe assembly containing a cartridge-needle unit ready for use;

Fig. 2 is a top view on a larger scale of the assembly of Fig. 1;

Fig. 3 comprises a top view and a side view of a portion of our syringe body illustrating the position of the finger hole;

Fig. 4, partly in section, illustrates the method of loading a cartridge-needle unit into one type of our syringe body;

Fig. 5, partly in section, illustrates the loading of a cartridge-needle unit into a modified type of our syringe body; and

Fig. 6 is a section on line 6-6 of Fig. 5.

In Figs. 1-3, the syringe barrel 1 contains a cartridge-needle unit comprising a cartridge proper 2 which is closed at one end by a slidable plunger 3 and is closed at the other end by a needle hub 4 having a needle 15 fixedly mounted therein. Plunger 3 has a threaded stud 5 for connection with a slidable push rod 6. Cartridge 2 has a neck 7 of reduced diameter, and needle hub 4 serves to secure a penetrable closure to the distal end of the cartridge. The hub may (Fig. 4) or may not (Fig. 5) be provided with an external screw thread 8. If present, it is non-functional in our syringe, but since cartridges of this type are in current use, it is an advantage of our

syringe that it can handle both types.

A raised internal arcuate fillet 9 at the distal end of the barrel and extending slightly less than halfway around the barrel on the side opposite a longitudinal opening 14 in the syringe barrel is so located longitudinally as to secure the cartridge against longitudinal movement, when the latter is seated in the barrel, by bearing against the proximal surface 10 of the hub, while the distal surface 11 of the hub bears on inner surface 12 of distal closure 13 of the barrel. The opening 14 is as wide as the internal diameter of the barrel and is sufficiently long to permit the insertion and seating of the cartridge within the barrel, the ends of said opening being spaced respectively from the proximal and distal closures of the barrel.

In the figures, a cartridge-needle unit is shown, but it is clear from the drawings that our syringe is equally usable with cartridges having no attached needle and needle hub provided that the cartridge has a shoulder or equivalent feature provided in place of the proximal needle hub surface 10 and capable of engaging fillet 9 or flange 109 (Fig. 5) in the same manner as described for surface 10, the diameter and location of an opening 18 at the distal end of the barrel being such as to retain the distal end of the cartridge solidly seated in the barrel when the cartridge is in position for injection.

A small finger hole 17 (Fig. 3) may be formed in the side of the syringe barrel opposite opening 14 to assist in disengaging the cartridge from the barrel when an injection is completed, but this feature is not essential to our invention.

The method of loading the syringe of Figs. 1-3 is illustrated in Fig. 4. The cartridge-needle unit is advanced at an angle into the barrel by passing the covered needle through opening 18 in distal closure 13 until surface 11 of hub 4 abuts on inner surface 12 of the distal closure. The cartridge is then swung as shown by arrow *a* around the edge of the hub as a fulcrum and seated in the barrel as shown in Figs. 1 and 2.

Push rod 6 is made with an enlargement 20 at its distal end only slightly smaller than the internal diameter of the cartridge and is provided with a relatively long bearing in hole 21 in proximal closure 22 of the barrel. Accordingly when push rod 6 is engaged with plunger 3 by stud 5 and internally threaded hole 23, cartridge 2 is securely held against rising out of the barrel and against lengthwise movement in either direction. On removal of rubber sleeve 16 which may be provided to cover needle 15, and assuming that cartridge 2 is, as customary, preloaded with an injectable drug, the syringe is ready for insertion of the needle, aspiration and injection.

A modified form of our syringe body is shown in Fig. 5. The barrel 101 is provided in its distal closure 113 with a relatively large opening 130

118 having a diameter less than the internal diameter of barrel 101. Instead of fillet 9, a functionally equivalent inwardly directed flange 109 is provided at the distal end edge of opening 14 to engage proximal surface 10 of the hub. The cartridge is loaded into the syringe at an angle as in Fig. 4, and rotated as shown by the arrow *b* around flange 109 as a fulcrum until seated in the barrel. Distal surface 11 of the hub 4 then bears on inner surface 113 of distal closure 112 and proximal surface 10 of hub 4 bears on flange 109. The push rod may then be engaged with plunger 3 as described above. If it is not desired to rely on the push rod to prevent accidental dislodgment of the cartridge, a spring latch 24 may be provided; screws 25 fixedly attach the latch to the syringe body, thus making the latch an integral part of the body. The latch is designed to be flexed away from the path of cartridge 2 by finger pressure on tab 26 but to snap back into position to retain the cartridge when the pressure is released. The distally directed tooth on tab 26 then engages the upper edge of the proximal end of cartridge 2. After use, finger pressure on tab 26 will release the cartridge.

Our syringe body may be fabricated of a synthetic plastic or of metal and may be transparent or opaque since most of the cartridge is exposed to view through the long opening in the barrel. The syringe body being of one piece is extremely economical to produce, and since it can be used equally well with cartridges having either threaded or unthreaded hubs, it is versatile in its applications.

It will be noted also that the cooperating securing means to prevent lengthwise movement of the cartridge are entirely at the distal end of the syringe and are integral with the syringe—viz. the fillet 9 or flange 109 and the inner wall 12 or 112 of the distal closure. This construction has two important advantages: it eliminates the need for separate parts at the other end of the syringe such as compression springs, spring followers, sliding tubes, threaded plugs and the like; it is independent of variations in the length of the cartridge, this dimension being at times subject to somewhat wide tolerances.

In the specification and claims the term "distal" is used to denote a position or direction towards the needle end of the syringe and "proximal" towards the push-rod end.

#### WHAT WE CLAIM IS:

1. A one-piece injection syringe body provided with a slidable push rod and adapted to be used with a cartridge having a slidable plunger at one end and a shoulder at the other end, said syringe body comprising a

tubular barrel, a proximal closure and a distal closure, a slidable push rod mounted in an axial opening in the proximal closure and having means for attachment to the cartridge plunger, an opening in the distal closure less in diameter than the internal diameter of the barrel, but sufficient to permit the passage of an injection needle, the barrel having an internal diameter to accommodate the cartridge and being provided with a central longitudinal opening as wide as the internal diameter of the barrel and sufficiently long to permit the insertion and seating of the cartridge within the barrel, the ends of said opening being spaced respectively from the proximal and distal closures, and a protuberance formed on the inner surface of the barrel near its distal end adapted to engage the cartridge shoulder and to cooperate with the distal closure wall in preventing lengthwise displacement of the cartridge during aspiration and injection.

2. A syringe according to claim 1, in which the protuberance is a raised arcuate fillet on the internal surface of the barrel opposite the central longitudinal opening and has an angular reach not over 180°.

3. A syringe according to claim 1, in which the protuberance is an inwardly directed flange formed on the distal end edge of the central longitudinal opening.

4. A syringe according to any one of the preceding claims, in which the axial opening in the distal closure has a diameter sufficient to accommodate a needle covered by a rubber sleeve and the longitudinal distance between the protuberance and the inner wall of the distal closure is adapted to accommodate and secure the needle hub of a cartridge-needle unit.

5. A cartridge-syringe assembly including in combination a syringe as claimed in any one of the preceding claims and a cartridge-needle unit mounted in the syringe, the cartridge-needle unit comprising a cartridge having a slidable plunger at one end connected to the slidable push rod of the syringe, a needle hub secured to the other end of the cartridge, a needle fixedly mounted in the needle hub, and a protective sleeve surrounding the needle, the protected needle projecting through the opening in the distal closure and the needle hub being firmly seated between the protuberance on the inner surface of the barrel and the inner wall of the distal closure.

6. A one-piece injection syringe body and the combination thereof with a cartridge-needle unit substantially as described and as illustrated in the accompanying drawings.

STEVENS, LANGNER, PARRY  
& ROLLINSON,  
Chartered Patent Agents.  
Agents for the Applicants.

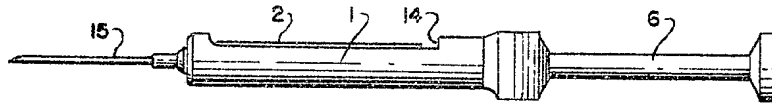


FIG. 1

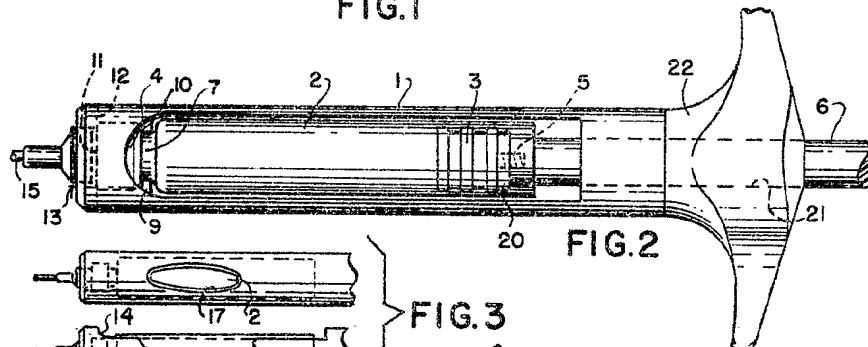


FIG. 2

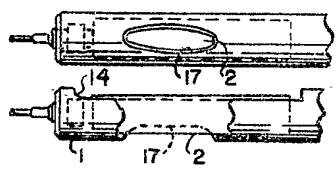


FIG. 3

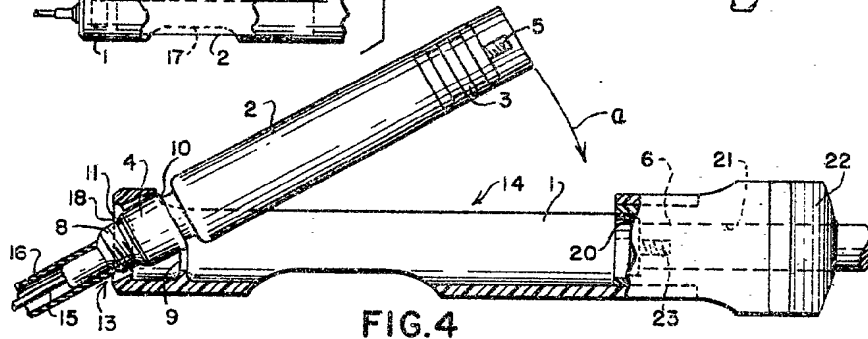


FIG. 4

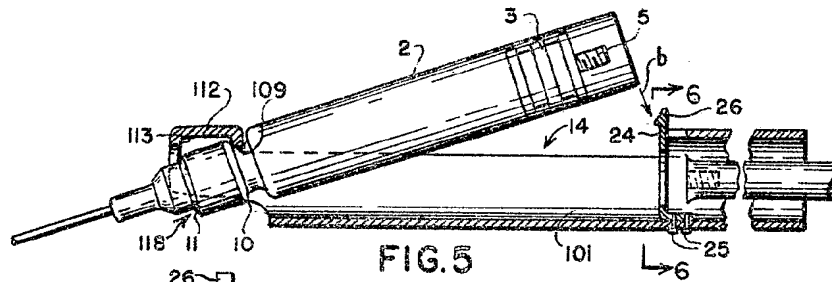


FIG. 5

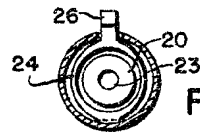


FIG. 6